PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in or relating to Mechanically Operated Lead Pencils

We, CONWAY STEWART AND COMPANY LIMITED, a British Company, and JAMES JEFF, a British Subject, both of 75 to 82, Shoe Lane, London, E.C.4, do hereby declare the nature of this invention to be as follows:—

This invention relates to mechanically operated lead pencils in which the lead is adapted to be projected to, and retracted from, the operative position by relative rotation, in one or other direction, of two parts of the pencil.

The object of the invention is the provision of an improved pencil of this character which will be of simple construction, and in which the relative rotation of the two parts will be smooth and easy and will be capable of being continued indefinitely beyond the positions of extreme projection and retraction without any of the parts suffering damage.

In accordance with the invention the lead carrier is mounted on one of the relatively rotatable parts so as to be capable of moving longitudinally but not rotatably with respect thereto, and the other relatively rotatable part comprises a tubular element having a spiral slot in which a projection from the lead carrier engages, said tubular element being capable of floating longitudinally within limits relative to the major portion of the latter relatively rotatable part and being preferably maintained at a rearmost limit by means of a spring abutting against the forward extremity.

A further feature of the invention is that the two relatively rotatable parts are connected together by means of small balls adapted to run around a groove in the one part and located in recesses formed in the other part. In this way the two parts are maintained against relative longitudinal movement while free and smooth relative rotary movement is permitted.

In accordance with one embodiment of the invention the lead is carried in a tubular lead carrier of the usual type which slides longitudinally within a tubular supporting sheath projecting rigidly from the forward end of the magazine.

Said lead carrier consists of a carrier tube which embraces the lead, and a carrier rod located within said carrier tube and whose forward extremity constitutes an abutment for the rear end of the lead. This carrier rod at its rear end has a lateral projection which projects through a longitudinal slot in the wall of the carrier tube, and said carrier rod is biased by means of a small ejector spring in a rearward direction relative to said carrier tube so that said lateral projection normally rests against the rear end of said slot. In this position the distance between the forward end of the carrier rod and the forward end of the carrier tube is sufficient to enable the latter to hold and maintain the lead, and by moving said carrier tube rearwardly, relative to the carrier rod in opposition to the ejector spring until the lateral projection approaches the forward end of the slot, the forward end of said carrier rod will project from the forward end of the carrier tube and the lead will be ejected.

The tubular supporting sheath has a longitudinal slot extending throughout the whole of its length and the lateral projection from the carrier rod passes through this slot as well as through the slot in the carrier tube, so that the lead carrier as a whole is prevented from rotating.

Surrounding the supporting sheath is a propeller tube with a spiral slot traversing it from end to end. The lateral projection from the carrier rod is adapted to pass through this spiral slot and, the longitudinal position of said propeller tube relative to the magazine and supporting sheath being fixed as will hereinafter appear, between relatively close limits, by rotating said propeller tube relative to said magazine and supporting sheath the lead carrier as a whole is adjusted longitudinally relative to the supporting sheath and the lead is projected to or retracted from, the operative position.

The movement of the propeller tube is governed by means of a bearing element which consists of a short metal tube the forward portion of which embraces the

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rear end of said propeller tube and the rear portion of which embraces the forward end of the magazine. This bearing element, as will hereinafter appear, is mounted on said magazine so as to be rotatable but not longitudinally movable with respect thereto, and, by means of a grub screw passing through said bearing element into a short longitudinal slot in the propeller tube, is connected to said propeller tube so that the latter is constrained to rotate with said bearing element, but, within the limits determined by the length of the short slot, is free to move longitudinally relative to said bearing element and therefore relative to the magazine and supporting sheath, as heretofore stated.

By means of a coil spring surrounding said supporting sheath and in compression between a collar fixed on the extremity of said supporting sheath and a collar loose against the extremity of the propeller tube, the latter is rearwardly biased relative to the supporting sheath so that the forward end of the short longitudinal slot normally rests against the grub screw.

The bearing element is screwed within the rear end of the point portion of the outer casing of the pencil, so that only the rear end of said bearing element remains projecting. The mounting of said bearing element on the magazine is effected by means of two small steel balls located in diametrically opposite holes in the wall of said bearing element and adapted to run around a circumferential groove in the periphery of said magazine. Said balls are prevented from passing through said holes by virtue of the said point portion of the outer casing covering said holes, and the balls thus constitute not only a journal ball bearing for the bearing element on the magazine but also a means for preventing longitudinal movement of said bearing element relative to said magazine as hereinbefore stated.

The rear portion of the pencil outer casing makes a friction tight fit upon the magazine and has its inner periphery counter-sunk at the forward end to enable it to pass over the rear projecting portion of the bearing element and abut against the point portion of said outer casing.

From the above it will be clear that in operation, the lateral projection from the carrier rod being in engagement in the spiral slot in the propeller tube, by rotating the point portion of the outer casing relative to the rear portion, the propeller tube will be rotated relative to the tubular supporting sheath, and, the latter being held at the rear end of its longitudinal range of movement by means of its controlling spring, the lead carrier as a whole will be propelled either forwardly or rearwardly as desired for projecting the lead beyond, or retracting it within, the point. As the lateral projection approaches the forward end of the spiral spot, the carrier tube engages the inner periphery of the point hole—which it is too large to pass through—so that further forward movement of the carrier rod then takes place without the carrier tube, the ejector spring being compressed, and the lead is duly ejected. When the lateral projection leaves the forward end of the slot the forward end of the carrier rod just appears within the point hole, and further rotary movement of the propeller tube in the same direction may take place without damaging any part of the mechanism, the lateral projection simply lying between the extremity of the propeller tube and the aforesaid collar which abuts against said extremity, the spring controlling the propeller tube being slightly compressed.

When the lateral projection leaves the rear end of the slot, further rotary movement of the propeller tube in the same direction may once more take place, the lateral projection lying between the rear end of the propeller tube and the forward end of the magazine, the spring controlling the propeller tube being again slightly compressed.

By drawing off the rear portion of the outer casing, access is obtained to the usual rubber stopper which closes the rear end of the magazine.

Dated this 18th day of September, 1933.
A. A. THORNTON,
Chartered Patent Agent,
7, Essex Street, Strand, London, W.C. 2,
For the Applicants.

COMPLETE SPECIFICATION

Improvements in or relating to Mechanically Operated Lead Pencils

We, CONWAY STEWART AND COMPANY LIMITED, a British Company, and JAMES JEFF, a British Subject, both of 75 to 82, Shoe Lane, London, E.C.4, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to mechanically operated lead pencils in which the lead is adapted to be projected to, and retracted

from, the operative position by relative rotation, in one or other direction, of two main portions of the pencil.

The object of the invention is the provision of an improved pencil of this character which will be of simple construction, and in which the relative rotation of the two parts will be smooth and easy.

The invention consists broadly in the arrangement that the two relatively rotatable portions are connected together by means of small balls adapted to run around a groove in the one portion and located in recesses formed in the other portion, so that the two parts are maintained against relative longitudinal movement while free and smooth relative rotary movement is permitted.

In order that the invention may be the more clearly understood a pencil in accordance therewith will now be described, reference being made to the accompanying drawings wherein:—

Fig. 1 is an outside view of said pencil.

Fig. 2 is a sectional view of the same.

Fig. 3 is a view to an enlarged scale partly in section of a portion thereof the plane of the section being at right angles to that of the preceding Fig.

Fig. 4 is a view, to an enlarged scale partly in section and partly broken away, of another portion thereof, the section being in the same plane as in Fig. 3.

Referring to these drawings, the lead 1 is carried in a tubular lead carrier 2 of the usual type which slides longitudinally within a tubular supporting sheath 3 projecting rigidly from the forward end of the magazine 4.

Said lead carrier 2 consists of a carrier tube 2*a* which embraces the lead 1, and a carrier rod 2*b* located within said carrier tube and whose forward extremity constitutes an abutment for the rear end of the lead. This carrier rod 2*b* at its rear end has a lateral projection 2*b*1 integral therewith which projects through a longitudinal slot 2*a*1 in the wall of the carrier tube 2*a*, and said carrier rod 2*b* is biased by means of a small ejector spring 2*c* (in compression between shoulders on said rod 2*b* and said carrier tube 2*a* as shown) in a rearward direction relative to said carrier tube 2*a* so that said lateral projection 2*b*1 normally rests against the rear end of said slot 2*a*1. In this position the distance between the forward end of the carrier rod 2*b* and the forward end of the carrier tube 2*a* is sufficient to enable the latter to hold and maintain the lead 1, and by moving said carrier tube 2*a* rearwardly, relative to the carrier rod 2*b* in opposition to the ejector spring 2*c* until the lateral projection 2*b*1 approaches the forward end of the slot 2*a*1, the forward end of said carrier rod 2*b* will project from the forward end of the carrier tube 2*a* and the lead 1 will be ejected.

The tubular supporting sheath 3 has a longitudinal slot 3*a* extending throughout the whole of its length and the lateral projection 2*b*1 from the carrier rod 2*b* passes through this slot as well as through the slot 2*a*1 in the carrier tube, so that the lead carrier 2 as a whole is prevented from rotating.

Surrounding the supporting sheath 3 is a propeller tube 5 with a spiral slot traversing it from end to end as shown. The lateral projection 2*b*1 from the carrier rod 2*b* is adapted to pass through this spiral slot 5*a* and, the longitudinal position of said propeller tube 5 relative to the magazine 4 and supporting sheath 3 being fixed as will hereinafter appear, between relatively close limits, by rotating said propeller tube 5 relative to said magazine and supporting sheath the lead carrier 2 as a whole is adjusted longitudinally relative to the supporting sheath and the lead 1 is projected to or retracted from, the operative position.

The movement of the propeller tube 5 is governed by means of a bearing element 6 which consists of a short metal tube the forward portion of which is of smaller bore and embraces the rear end of said propeller tube as shown, and the rear portion of which is of larger bore and embraces the forward end of the magazine 4. This bearing element 6, as will hereinafter appear, is mounted on said magazine 4 so as to be rotatable but not longitudinally movable with respect thereto, and, by means of a small pressed out projection 5*b* on the propeller tube 5 passing into a short longitudinal slot 6*a* formed in the inner surface of the bearing element 6, said bearing element is connected to said propeller tube so that the latter is constrained to rotate with said bearing element, but, within the limits determined by the length of the short slot 6*a*, is free to move longitudinally relative to said bearing element and therefore relative to the magazine 4 and supporting sheath 3 as heretofore stated.

By means of a coil spring 7 surrounding said supporting sheath 3 and in compression between a collar 8 fixed on the extremity of said supporting sheath and a collar 9 loose against the extremity of the propeller tube 5, the latter is rearwardly biased relative to the supporting sheath so that the rear end of said propeller tube normally rests against the forward end of the magazine 4.

The bearing element 6 is screwed as

shown into the rear end of the front portion 10 of the outer casing of the pencil, so that only the rear end of said bearing element remains projecting. The mounting of said bearing element 6 on the magazine 4 is effected by means of two small steel balls 11 located in diametrically opposite holes 6*b* (Fig. 3) in the wall of said bearing element and adapted to run around a circumferential groove 4*a* in the periphery of said magazine. Said balls 11 are prevented from passing through said holes 6*b* by virtue of said front portion 10 of the outer casing covering said holes as shown, and it will be seen that the balls constitute not only a journal ball bearing for the bearing element 6 on the magazine 4 but also a means for preventing longitudinal movement of said bearing element relative to said magazine as hereinbefore stated.

The rear portion 12 of the pencil outer casing carries an inner sheath 12*a* which makes a friction tight fit upon the magazine and abuts against the rear extremity of the bearing element 6 with said rear portion 12 abutting against the front portion 10 of said outer casing.

From the above it will be clear that in operation, the lateral projection 2*b*1 from the carrier rod 2*b* being in engagement in the spiral slot 5*a* in the propeller tube 5, by rotating the front portion 10 of the outer casing relative to the rear portion 12, the propeller tube 5 will be rotated relative to the tubular supporting sheath 3, and, the former being held at the rear end of its longitudinal range of movement by means of its controlling spring 7, the lead carrier 2 as a whole will be propelled either forwardly or rearwardly as desired for projecting the lead 1 beyond, or retracting it within, the point 13. As the lateral projection 2*b*1 approaches the forward end of the spring slot 5*a*, a shoulder 2*a*2 on the carrier tube 2*a* engages a corresponding shoulder in the bore of the point 13 so that further forward movement of the carrier rod 2*b* then takes place without the carrier tube 2*a*, the ejector spring 2*c* being compressed, and the lead 1 is duly ejected.

When the lateral projection 2*b*1 leaves the forward end of the slot 5*a* the forward end of the carrier rod 2*b* is just flush with the forward end of the carrier tube 2*a* and further rotary movement of the propeller tube 5 in the same direction may take place without damaging any part of the mechanism, the lateral projection 2*b*1 simply lying (as in Fig. 4) between the extremity of the propeller tube 5 and the aforesaid collar 9 which abuts against said extremity, the spring 7 controlling the propeller tube being slightly compressed.

When the lateral projection 2*b*1 leaves the rear end of the slot 5*a*, further rotary movement of the propeller tube in the same direction may once more take place, the lateral projection lying between the rear end of the propeller tube 5 and the forward end of the magazine 4, the said spring 7 controlling the propeller tube being again slightly compressed.

By the drawing off the rear portion 12 of the outer casing, access is obtained to the usual rubber stopper 14 which closes the rear end of the magazine 4.

We are aware that mechanically operated pencils have been heretofore proposed in which movement of the lead carrier to and from the operative position is effected by the rotation relatively thereto of a surrounding tubular propeller element having therein a spiral slot in which a projection from said lead carrier engages, said spiral slot extending completely through said propeller element from end to end so that rotation of the latter may be effected until the projection leaves the slot at either end, after which rotation may be continued without the device being strained or damaged.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A mechanically operated pencil comprising two main portions by relative rotation of which the lead is adapted to be propelled, wherein said two main portions respectively comprise inner and outer parts one of which is formed with a circumferential groove and the other with recesses having balls therein which run in said groove so as to permit of free rotary, but prevent axial, relative movement.

2. A mechanically operated pencil according to claim 1, wherein said outer part comprises a tubular element with holes through its wall in which the balls are located and a surrounding element which maintains said balls within said holes.

3. A mechanically operated pencil according to claims 1 or 2, wherein the lead carrier is capable of only longitudinal movement with respect to one of said portions and said longitudinal movement is adapted to be effected by the rotation relatively thereto of a surrounding tubular propeller element constrained to rotate with the other portion and having therein a spiral slot in which a projection from said lead carrier engages, said spiral slot extending completely through said propeller element from end to end so that

rotation of said propeller element may be effected until said projection leaves said slot at either end after which rotation may be continued without any part of the device being strained or damaged.

4. A mechanically operated pencil according to claim 3, wherein said propeller element is itself capable of longitudinal movement relative to said other portion being held against a fixed abutment at one end by means of a spring loaded abutment at the other so that when said projection leaves said slot at either end it will be maintained against the propeller element at that end, either by the direct pressure of the spring loaded abutment or by the reaction of the fixed abutment, so that it will positively re-enter the slot upon the propeller element being rotated in the appropriate direction.

5. A mechanically operated pencil according to claim 4, and in which said lead carrier slides longitudinally within a tubular supporting sheath comprised in said former portion, and said projection also passes through a longitudinal slot in said sheath whereby the lead carrier is prevented from rotating relatively to said sheath, wherein said propeller element surrounds said sheath, said fixed abutment being in rigid relation to said sheath and said spring loaded abutment surrounding said sheath and being biased relative thereto.

6. A mechanically operated pencil according to claim 5, wherein said fixed abutment is constituted by the extremity of the usual magazine.

7. A mechanically operated pencil according to any of claims 4 to 6, wherein the rotation of said propeller element is effected by means of a surrounding tube connected to said propeller element by a connection which permits of relative longitudinal, but not lateral, movement.

8. A mechanically operated pencil according to claim 7, wherein said connection consists of a pressed out projection on said propeller element engaging in a slot in said surrounding tube.

9. A mechanically operated pencil according to claim 1 or 2 and claim 6, wherein said inner part is constituted by said magazine.

10. A mechanically operated pencil according to any of claims 1, 2 or 9 and claim 7 or 8 wherein said outer part comprises said surrounding tube.

11. A mechanically operated pencil according to claim 10 and claim 2, wherein said tubular element recited in claim 2 is constituted by said surrounding tube recited in claim 10.

12. A mechanically operated pencil according to claim 11, wherein said surrounding element recited in claim 2 is constituted by the point element of the pencil.

13. A mechanically operated pencil according to any of the preceding claims wherein said lead carrier comprises an outer tubular part in which the lead fits and an inner rod forming a supporting abutment for said lead, said inner rod being biased to a limiting rearward position with respect to said outer tubular part and the projection from said lead carrier being in rigid relation to said inner rod substantially as and for the purposes specified.

14. A mechanically operated pencil substantially as herein described with reference to the accompanying drawings.

Dated this 17th day of September, 1934.

A. A. THORNTON,
Chartered Patent Agent,
7, Essex Street, Strand, London, W.C. 2,
For the Applicants.

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[This Drawing is a reproduction of the Original on a reduced scale.]

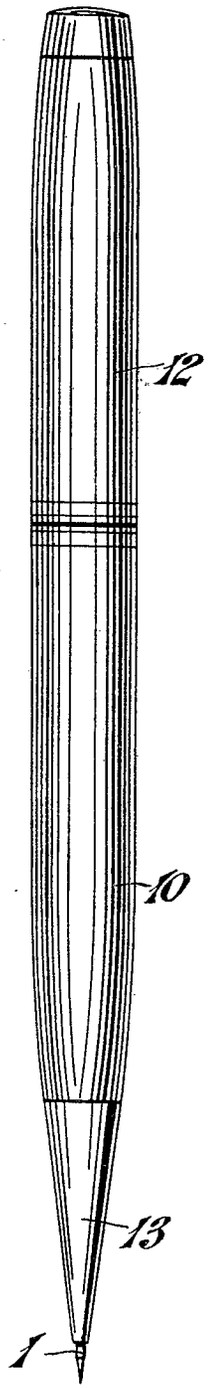

Fig.1.

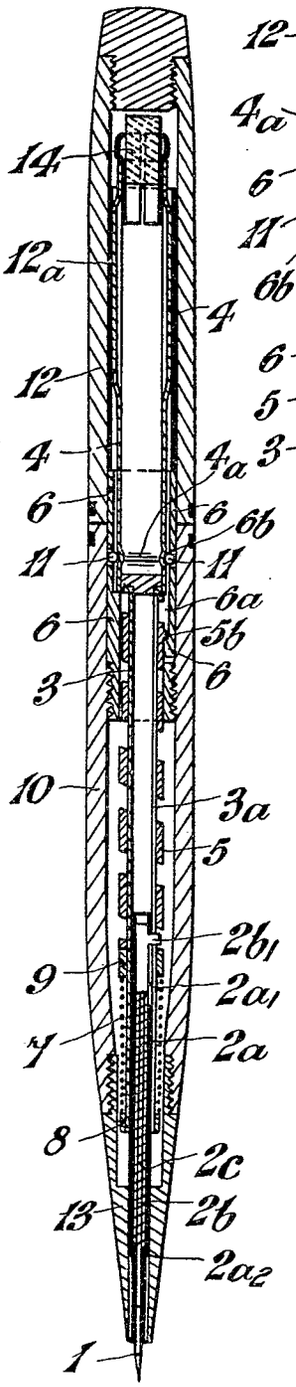

Fig.2.

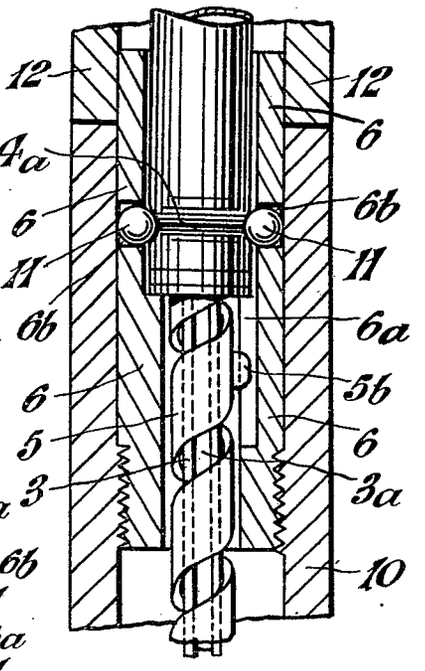

Fig.3.

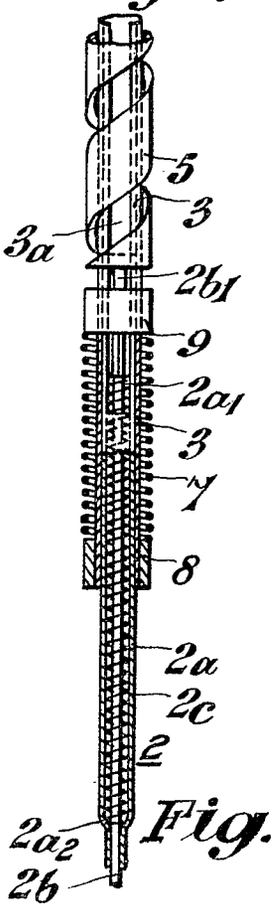

Fig.4.

Malby & Sons, Photo-Lith